

Commissioner for Patents
Amendment dated September 8, 2004
Response to Office Action dated June 8, 2004
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Serial: 10/607958
Art Unit: 2835
Examiner: Chervinsky
Docket No. RPS9 2003 0066 US1

Amendments to the Specification:

Please amend the following numbered paragraphs as indicated:

[0015] Referring now to FIG 2, one embodiment of a fan sink assembly 200 according to the present invention is depicted. The depicted assembly 200 includes a fan ~~{102}~~ 202, a heat sink ~~{110}~~ 204, and an integral vibration isolation element-fan shroud ~~{202}~~ 206 that receives and locates the fan ~~{102}~~ 202 relative to the heat sink ~~{110}~~ 204. In this embodiment, the vibration isolation element ~~{202}~~ 206 serves the purpose of affixing the fan ~~{102}~~ 202 to the heat sink ~~{110}~~ 204 in place of the fan shroud 104 (FIG 1) typically used in the currently produced fan-heat sink assemblies. The vibration isolation component ~~{202}~~ 206 is produced from an elastomeric material, of which rubber is an example, having sufficient rigidity to receive the fan and a damping coefficient sufficient to reduce or eliminate the transmission of vibrational energy from the fan ~~{102}~~ 202 to the heat sink ~~{110}~~ 204.

[0016] Continuing, FIG 3 depicts the integral vibration isolation component-fan shroud ~~{202}~~ 206 of the embodiment depicted in FIG 2. The vibration isolation component-fan shroud ~~{202}~~ 206 includes a carrier structure 301 that defines a cavity 302 of dimensions matched to the dimensions of the fan ~~{102}~~ 202. The carrier structure 301 includes a base that defines an opening 304 whose dimension matches the active area of the fan ~~{102}~~ 202, allowing air flow through the vibration isolation component-fan shroud ~~{202}~~ 206 and the heat sink ~~{110}~~ 204, legs 306 and cross-bands 308 which connect opposing pairs of legs 306. An opposing cavity 306 captures the top surfaces of the heat sink.

[0017] In ~~{use}~~ use, the fan ~~{102}~~ 202 is received into the cavity 302 of the integral vibration isolation component-fan shroud ~~{202}~~ 206. Since the vibration isolation-fan shroud ~~{202}~~ 206 is made from an elastomeric material, it has an inherent compliance that allows the cavity 302 to deform a necessary to receive the fan ~~{102}~~ 202 and then return to its original shape, retaining the fan ~~{102}~~ 202. The dimensions of opening 304 in the floor of the fan cavity 302 match the dimensions of the active flow area of the fan ~~{102}~~ 202. As the fan ~~{102}~~ 202 spins under power, air moved by the fan ~~{102}~~ 202 is free to flow through the opening 302. Since the fan ~~{102}~~ 202 is encapsulated in the cavity 302 of the vibration isolation component-fan shroud ~~{202}~~ 206, all air flow related to the fan ~~{102}~~ 202 must go through the heat sink ~~{110}~~ 204, increasing the cooling efficiency of the heat sink-fan assembly 200 by reducing air flow in non-useful directions. The fan-vibrational isolation-fan shroud subassembly is then affixed to the heat sink ~~{110}~~ 204. The legs 306 and cross-bands 308 of the vibrational isolation component-fan shroud ~~{202}~~ 206 act like elastic bands due to the elastomeric properties of the material of which it is made, to receive the heat sink ~~{110}~~ 204, deforming as necessary to receive the heat sink ~~{110}~~ 204 and then returning to their original dimensions, surrounding and retaining the heat sink ~~{110}~~ 204 in position. The opposing cavity 310 conforms to the perimeter of the top surface of the heat sink ~~{110}~~ 204, further insuring that all air flow moves through the pins or fins of the

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heat sink ~~{110}~~ 204. The elastomeric material used for the integral vibrational isolation component-fan shroud may be a solid ~~{elastomer, or a}~~ or foam elastomer, with its properties designed as required by the vibrational frequency of the energy whose transmission is to be eliminated or reduced and by the dimensional requirements of the mechanical assembly.

[0019] FIG 5 depicts an alternative embodiment of the integral vibration isolation component-fan shroud 500 produced using both an elastomeric material and a metal frame, similar to a conventional fan shroud 104. In this embodiment the metal frame 502 includes a frame, which is over-molded by the elastomer of the cavities 302 and 310, legs ~~{114}~~ 506 and feet ~~{116}~~ 508, which serve to affix the shroud 500 to the heat sink 110. Additional elastomer sections 504 are molded to the feet 116, isolating the heat sink from the vibration of the fan 102.

[0020] FIG 6 depicts an alternative embodiment 600 including a fan ~~{102}~~ 202, a heat sink ~~{110}~~ 204, a fan shroud ~~{104}~~ 602, and a vibration isolation component in the form of a gasket ~~{602}~~ 604 which affixes both to the fan ~~{102}~~ 202 and the fan shroud ~~{104}~~ 602, producing a fan-fan shroud subassembly ~~{108}~~ 606 and vibrationally isolating the fan ~~{102}~~ 202 from the fan shroud ~~{104}~~ 602. The elastomeric gasket ~~{602}~~ 604 prevents transmission of vibrational energy from the fan ~~{102}~~ 202 to the fan shroud ~~{104}~~ 602. The fan-fan shroud subassembly ~~{108}~~ 606 affixes to the base of the heat sink ~~{110}~~ 204 by means of flexible legs ~~{114}~~ 608 which are capable of deforming elastically a sufficient amount to allow the formed members or feet ~~{116}~~ 610 at the base of the legs ~~{114}~~ 608 to capture the heat sink ~~{110}~~ 204 between opposing pairs of legs ~~{114}~~ 608. The material from which the gasket ~~{602}~~ 604 is made is an elastomeric material, of which natural rubber is an example. It may be a solid elastomer, molded to shape; a foam elastomer, molded to shape; a solid elastomer, stamped from a sheet; or a foam elastomer, stamped from a sheet.

[0021] FIG 7 depicts the vibration isolation gasket ~~{602}~~ 604 of the embodiment depicted in FIG 6. The gasket includes a geometric flat shape 702 approximating the shape and dimensions of the fan ~~{102}~~ 202 and an opening 704 whose dimensions and shape are congruent to the dimensions and shape of the active area of the fan ~~{102}~~ 202. Air moved by the fan ~~{102}~~ 202 moves through the opening in the gasket ~~{602}~~ 604 to reach the heat sink ~~{110}~~ 204. An adhesive material, ~~{which}~~ having the required resistance to heat, mechanical strength, and adherence may be dispensed on to one side of the gasket ~~{602}~~ 604 and the gasket affixed to the fan shroud ~~{104}~~ 602. Adhesive is then applied to the opposing side of the gasket ~~{602}~~ 604 and the fan ~~{102}~~ 202 is affixed to the fan shroud-gasket subassembly. The adhesive layers are cured, typically using a thermal process. The resulting fan-gasket-fan shroud subassembly is then affixed to the heat sink using the elasticity of the fan shroud legs ~~{114}~~ 608 and the dimensions of the fan shroud feet ~~{116}~~ 610 as depicted in FIG 1.

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[0022] FIG 8 depicts an alternative embodiment 800 of the gasket ~~{602}~~ 604 depicted in FIG 7. Before ~~{the assembly to}~~ being assembled with the fan ~~{102}~~ 202 (see FIG 6) and the fan shroud ~~{104}~~ 602 the gasket material is in the form of a flat sheet. The material may be a solid elastomer material or a foam elastomer material. Pressure sensitive adhesive 802 with a disposable release liner is laminated to opposing sides of the material from which the gasket ~~{602}~~ 604 will be made, forming a composite sheet material. The geometry required by the dimensions of the fan, the outline of the flat shape 702 and the dimensions and location of the opening 704 in the gasket, is produced ~~{by stamping}~~ from the composite sheet material by a stamping process, producing the gasket-adhesive subassembly depicted in FIG 8. To produce a fan-fan shroud sub-assembly, the disposable release liner is removed from the precut gasket-adhesive, exposing the press-sensitive adhesive. The gasket-adhesive material is then affixed by pressure to the fan ~~{102}~~ 202. The disposable release liner is then removed from the free side of the gasket-adhesive combination, exposing the second adhesive surface. The second adhesive surface of the fan-adhesive sub assembly is then affixed to the fan shroud ~~{104}~~ 602, with pressure applied to produce the bond.

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